Model lesson 11.9/11.4

Week 3 Semester 2

**Topic:** Understanding basic aliphatic organic chemistry

**Curriculum standards:**

|  |  |  |  |
| --- | --- | --- | --- |
| 19.1 | Know, interpret and use the nomenclature and molecular and structural formulae of alkanes |  |  |
| 19.2 | Describe the chemistry of alkanes as exemplified by their combustion. |  |  |
| 19.3 | Know that the main use of alkanes is as fuels and that the size of the molecule determines what kind of fuel it is and how it is used | Boiling points of alkanes  Trends in the physical properties of alkanes |  |
| 19.5 | Illustrate structural isomerism in alkanes |  |  |
| 19.7 | Know that petroleum and natural gas are sources of organic compounds |  |  |

### **Previous learning**

To meet the expectations of this unit, students should already know that carbon forms covalent compounds with four bonds and that life is based on structures of carbon atoms.

**Previous knowledge:**

Know how a variety of fuels and other useful compounds can be obtained from petroleum and natural gas – fractional distillation

Know the carbon cycle and that products from combustion of hydrocarbo-based fuels can inflict damage on the environment.

Know that build up of methane & carbon dioxide is leading to warming of atmosphere

**Lesson plan:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Time (mins)** | **What** | **How** | **resources** |
| 10 | Introduction – do the students know tetravalent nature of C and that it is the foundation of organic molecules | Worksheet to be done in class | worksheet |
| 20 | Hydrocarbons are composed of hydrogen and carbon only.  Alkanes are a family of hydrocarbons which form a homologous series (saturated) | Students make first 4 alkanes using molymods  Students determine general formula for the homologous series is CnH2n+2  Students complete a table to list the graphical and structural formulae of the first 4 alkanes.  Students determine the molecular formulae of the first 10 alkanes by using the general formula | Molymods  Groups of 4 |
| 10 | Chain isomers of butane | Students construct straight and branched molecules of butane. Naming system is introduced: butane and methylpropane  Students copy diagrams of each into their books.  Write definition of isomer from yellow box p 165  Students are invited to construct isomers of pentane (work with another group) | p. 163 Advanced Chemistry for You.  If finished, complete Q4, p 165 |
| 10 | Alkanes as fuels | That the complete combustion products of hydrocarbons are carbon dioxide and water.  That the products of incomplete combustion are C or CO | Propane burner  Wax candle |
| 5 | Plenary | Summary of lesson objectives  Review homework |  |

**Student Exercise**

Class 11.4 period 5 25 Feb 2009

Student name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Here is the Periodic table of the first 18 elements:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII | VIII |
| 1 | 1H |  | | | | | | 2He |
| 2 | 3Li | 4Be | 5B | 6C | 7N | 8O | 9F | 10Ne |
| 3 | 11Na | 12Mg | 13Al | 14Si | 15P | 16S | 17Cl | 18Ar |

1. Find **carbon** in the Periodic Table
2. Write the **symbol** for ‘carbon’: رمز
3. **Explain** what the ‘6’ means:اشرح
4. Explain what the numbers in the **left-hand column** mean:العمود اليساري
5. Explain what the numbers in the **top row** mean:الصف الأعلى
6. The **valency** of carbon is:تكافؤ
7. How many **covalent bonds** can carbon form?وصلات – روابط

**Homework**

Class 11.4 period 5 25 Feb 2009

Student name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**استخدم المعلومات**

**Use the information** in the table to **plot a line graph** of number of carbon atoms (x axis) against boiling point (y axis). **لرسم خط بياني**

|  |  |  |
| --- | --- | --- |
| Name of alkane | Number of  C atoms | Boiling point (°C) |
| Methane | 1 | -161 |
| Ethane | 2 | -89 |
| Propane | 3 | -42 |
| Butane | 4 | -1 |
| Pentane | 5 | 36 |
| Hexane | 6 | 68 |
| Heptanes | 7 | 98 |
| Octane | 8 | 126 |
| Nonane | 9 | 151 |
| Decane | 10 | 174 |

**Use your graph to answer the questions:**

1. Which alkanes would be gases at room temperature?
2. Which alkanes would be liquids at room temperature?

**Refer to p 167 of Advanced Chemistry for You**. **Read** the information on the page.

1. Compare your graph with the graph of p 167. Is it the same shape?
2. **Copy** the information in the **red box** into your notebook.

**Explain the following terms:**

1. Van der Waal’s forces:
2. Isomers:

**Use the internet** or some other source of information **to write a paragraph** about the Petrochemical Industry in Qatar. Write your answer **in English**.

Make a list of the information you used (**Bibliography**):

**Assessment rubric for Homework:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Question | Answer | Sufficiency | | |
| Plotting graph of alkane boiling pt vs chain length | Graph oriented correctly  Points clearly marked and in correct position  Both axes labeled with quantity, unit of temperature stated  Points joined with smooth curve | Orientation and shape of curve correct  **Achievement objective or Success criterion:** Student is able to use tabulated data to plot a line graph | | |
| Which alkanes are gases at room temp | Methane, ethane, propane, butane | All 4 | **Achievement objective or Success criterion:** student can interpret graph | |
| Which alkanes are liquids at room temp | Pentane, hexane, heptanes, octane, nonane, decane | Any 3 |
| Copy information on  p 167 |  | Completed  **Achievement objective or Success criterion:**  Student can locate information in a textbook with guidance | | |
| Explain ‘van der Waals forces’ | eg definition from p67 | Completed | | **Achievement objective or Success criterion:** student can independently locate information in a textbook |
| Explain ‘isomers’ | eg definition p 137 | completed | |
| Use internet or similar to write paragraph about Qatar petrochemical industry | It is paragraph  It is factually correct  Surface features satisfactory  Appropriate language | Minimum on sentence, legible, factually correct  **Achievement objective or Success criterion:** Student can write legibly, observing rules of grammar and with correct spelling | | |
| bibliography | Source acknowledged | Included  **Achievement objective or Success criterion:** Student can independently locate information from secondary source | | |

Matrix of student achievement

|  |  |
| --- | --- |
| **Achievement objective** | **Date achieved** |
| Student is able to use tabulated data to plot a line graph |  |
| Student can interpret graph |  |
| Student can locate information in a textbook with guidance |  |
| Student can independently locate information in a textbook |  |
| Student can write legibly, observing rules of grammar and with correct spelling |  |
| Student can independently locate information from secondary source |  |